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The Southern Forest Experiment Station in 1940 made a study of pulpwood- and sawlog-production costs in the western part of the pine-hardwood region of the Lower South.1/

The war has significantly altered the costs observed in 1940. Labor efficiency has dropped. Wage rates have risen. Transportation costs have gone up because of the shortage of new trucks, high maintenance costs, poor tires, and the increased price of equipment and supplies such as trucks, tools, and feed. Supervision costs have risen with the change from contract to direct-employment operations.

In order to determine how far pulpwood- and log-production costs have risen since 1940, a study has been made to bring the old figures up to date and to draw a comparison between 1945 and 1940. It must be remembered that this comparison covers only part of the steps of production between the tree and the finished product. There are other elements of lumber-production cost, for example, that are not here considered. The data do not, therefore, show changes in total cost of finished products. It must be remembered, too, that the data apply only to dry-weather logging in the Crossett, Ark., area, though they are in such form that they can readily be revised to apply to other conditions and localities.

Type of Equipment Used

Some log and pulpwood contractors are now using power saws for felling and bucking; others are using tractors for bunching and loaders for loading. Most, however, are still using cross-cut and bow saws for felling and bucking and teams for both skidding and loading, just as they did in 1940. Since this is true and since it is desired to determine costs in 1945 as compared to 1940, the present study is based on the use of hand labor and teams.

There has been very little change since 1940 in the type or construction of trucks and trailers used in the hauling of either logs or pulpwood. Pulpwood costs given herein, therefore, are based on the use of regular 1-1/2-ton trucks with 85-horsepower motors and with dual wheels on the rear. Log costs are based on a standard truck and pole-trailer outfit with both the truck and trailer dual-wheeled. Tires used in 1945 are larger than in 1940 and are usually 7.50 x 20 on the front wheels and 8.25 x 20 on the rear and on the log trailer. In 1940 most tires used were 32 x 6 size.

1/ Reynolds, R. R. Pulpwood and log production costs as affected by type of road. Southern Forest Expt. Sta. Occasional Paper 96, 11 pp., tables. Oct. 14, 1940.

Cost of Log and Pulpwood Cutting

In 1945 the average daily production of 2-man felling and bucking crews is approximately 4,000 feet of logs (Doyle-Scribner rule) or 14 pens (approximately 3.5 standard cords) of pulpwood. In both cases this is less than in 1940; however, to earn a living wage, workers do not need to produce as much per day because of the higher wage rates now being paid. The comparative cost of cutting, per crew of two men per hour of operation, for the two periods is shown in table 1.

Table 1.--Estimated hourly cost of a felling and bucking crew of two men

Item	1940		1945	
	Dollars		Dollars	
A. Current operating costs:				
1. Direct labor costs: 1/				
Labor--2 men	.600		1.120	
Social security--employer 4%	.024		.045	
Total		.624		1.165
2. Other direct costs:				
Supplies--oil, wedges, etc.	.026		.033	
Maintenance	.004		.063	
Supervision	.043		.063	
Total		.073		.159
B. Ownership costs:				
1. Depreciation of saws, axes	.008		.010	
2. Interest, taxes, insurance	.001		.001	
Total		.009		.011
All costs		.706		1.335

1/ Average production per 8-hour day:

	Logs	Pulpwood
1940	6,000 bd.ft. Doyle-Scribner	4.0 std. cords
1945	4,000 bd.ft. Doyle-Scribner	3.5 std. cords

Cost of Log Skidding and Loading

Log-skidding and -loading costs, also, have increased considerably, chiefly because of increases in wage rates and the cost of team feed. The skidding cost per unit of one team and driver in 1940 was $0.62; now it is $1.19. The breakdown of costs per hour of operation for each of the two periods is given in table 2.

Table 2.--Estimated hourly cost per crew of one team and driver skidding and loading logs

Item	1940		1945	
	Dollars		Dollars	
A. Current operating costs:				
1. Direct labor costs:				
Teamster	.300		.600	
Social security--employer 4%	.012		.024	
Total		.312		.624
2. Other direct costs:				
Feed	.187		.400	
Harness and equipment upkeep	.025		.050	
Supervision	.043		.063	
Total		.255		.513
B. Ownership costs:				
1. Depreciation of team	.041		.041	
2. Interest, taxes, etc.	.009		.009	
Total		.050		.050
All costs		.617		1.187

Cost of Operating Trucks and Trailers

Like woods costs, basic items of transportation cost have increased greatly. Trucks are more expensive; tires last about half as long; running expenses are about double those of 1940; and labor is more expensive. Comparison of truck costs per hour of operation or mile of distance is given in table 3 for trucks used on pulpwood production and table 4 for trucks and trailers used on log hauling.

Comparison of 1945 With 1940 Pulpwood- and Log-Production Costs

The total cost of producing logs and pulpwood in 1945 as compared with 1940 is given in table 5. These figures are based on the following output per 8-hour day per cutting crew of two men: in 1940, 4.005 standard cords of pulpwood or 6,000 feet (Doyle rule) of logs; in 1945, 3.5 cords of pulpwood or 4,000 feet of logs. The output per log-skidding and -hauling crew was assumed to be 5,600 feet Doyle rule per 8-hour day, the same as in 1940. The output of pulpwood per truck is also assumed to be the same in both periods. In 1940 the pulpwood-hauling crew was composed of the driver and an average of 1.63 helpers. In 1945 the driver and two helpers made up the crew. In the hauling of both logs and pulpwood the loading, unloading, and delay time are based on hourly rates. Hauling is based on the cost or running expense per mile of distance and changes with the type of road, which in turn affects speed and wear and tear. In table 5 it is assumed that the hauling of both logs and pulpwood will be over 1/2 mile of woods road, 1-1/2 miles of graded dirt road, and 5 miles of gravel road. For distances or types of road different from these the cost figures would, of course, have to be changed. The 1940 and 1945 production-cost figures are both based on net cost plus a 20-percent allowance for profit and risk.

Table 3.--Estimated costs per truck used for pulpwood hauling (1-1/2-ton, 85-horsepower truck)

Item	1940	1945
	Dollars	Dollars
Investment:		
Truck complete with cab and dual wheels	950.00	1,740.12
Minus tires[1]	-300.00	-567.48
Net investment	650.00	1,172.64
Minus truck trade-in value	-200.00	-400.00
Total amount to be depreciated	450.00	772.64
Fixed Expenses:		
Interest on investment[2] at 6% per year	35.62	60.22
License and taxes per year	51.31	51.31
Operating overhead and risk per year	20.00	50.00
Total (per year)	106.93	161.53
Fixed expenses above, per day (225-day year)	.475	.718
Depreciation of truck per day (life=400 days)	1.500	1.932
Total (per day)	1.975	2.650
Fixed expenses above, per hour (10-hour day, truck only)	.198	.265
Driver and 2 helpers, cost per hour	.789	1.600
Supervision per unit per hour	.043	.063
Social security and insurance--4% of labor cost	.033	.067
All fixed expenses per hour	1.063	1.995
Running expenses per mile:		
Woods or low-quality road:		
Tires (life=4,000 miles in 1945)	.038	.142
Gasoline--5 miles per gallon	.040	.040
Oil and grease	.003	.003
Repair labor	.003	.010
Repair supplies	.003	.010
Total	.087	.205
Graded dirt or better-quality road:		
Tires (life=7,500 miles in 1945)	.020	.076
Gasoline--9 miles per gallon	.022	.022
Oil and grease	.003	.003
Repair labor	.003	.010
Repair supplies	.003	.010
Total	.051	.121

1/ Cost of tires charged against running expenses in 1945:
Front tires and tubes, 7.50 x 20, $89.74 each.
Rear tires and tubes, 8.25 x 20, $97.00 each.

2/ Average investment = $\frac{\text{initial investment} + \text{trade-in value}}{2} + \frac{\text{annual depreciation}}{2}$

$$1945 = \frac{1,172.64 + 400.00}{2} + \frac{434.61}{2} = 1,003.62$$

Table 4.--Estimated costs per truck used for log hauling (1-1/2-ton, 85-horsepower truck with trailer)

Item	1940	1945
	Dollars	Dollars
Investment:		
Truck complete with cab and dual wheels	950.00	1,740.12
Trailer complete with dual wheels	450.00	603.43
Gross investment	1,400.00	2,343.55
Minus tires[1]	-500.00	-955.48
Net investment	900.00	1,388.07
Minus trade-in value of truck and trailer	-300.00	-450.00
Total amount to be depreciated	600.00	938.07
Fixed Expenses:		
Interest on investment[2] at 6% per year	47.81	68.54
License and taxes	51.31	51.31
Operating overhead and risk	20.00	50.00
Total (per year)	119.12	169.85
Fixed expenses above, per day (225-day year)	.529	.755
Depreciation of truck[3] and trailer[4] per day	1.750	2.208
Total (per day)	2.279	2.963
Fixed expenses per hour (10-hour day), truck and trailer only	.228	.296
Driver, cost per hour	.300	.600
Supervision per unit per hour	.043	.063
Social security and insurance--4% of labor cost	.014	.027
All fixed expenses per hour	.585	.986
Running expenses per mile:		
Woods or low-quality road:		
Tires (life=4,000 miles in 1945)	.062	.239
Gasoline--4 miles per gallon	.050	.050
Oil and grease	.003	.003
Repair labor	.003	.010
Repair supplies	.003	.010
Total	.121	.312
Graded dirt or better-quality road:		
Tires (life=7,500 miles in 1945)	.033	.127
Gasoline--8 miles per gallon	.025	.025
Oil and grease	.003	.003
Repair labor	.003	.010
Repair supplies	.003	.010
Total	.067	.175

1/ Cost of tires charged against expenses in 1945:
Front tires and tubes, 7.50 x 20, $89.74 each.
Rear and trailer, 8.25 x 20, $97.00 each.

2/ Average investment in 1945 = truck $1,003.62 (see table 3)
Trailer in 1945 = $\frac{165.43 + 50.00}{2} + \frac{62.10}{2} = 1,142.38$

3/ Life=400 days.

4/ Life=600 days.

Table 5.--Comparison of 1945 with 1940 pulpwood- and log-production costs 1/

Item	Cost in 1940	Cost in 1945	Cost increase	
	Dollars	Dollars	Dollars	Percent
Pulpwood:				
Felling and bucking 2/	1.69	3.69	2.00	118
Loading, unloading, delay 3/	.81	1.52	.71	88
Hauling 3/	.95	2.02	1.07	113
All costs	3.45	7.23	3.78	110
Logs:				
Felling and bucking	1.13	3.23	2.10	186
Skidding	.69	1.34	.65	94
Loading, unloading, delay 4/	.90	1.61	.71	79
Hauling 4/	1.24	2.87	1.63	131
All costs	3.96	9.05	5.09	129

1/ Computed at cost plus 20 percent for profit and risk.
2/ Per standard cord of penned wood.
3/ Per standard cord hauled over 1/2 mile of woods road, 1-1/2 miles of graded dirt road, and 5 miles of gravel road.
4/ Per thousand feet Doyle-Scribner rule for loads averaging 1,400 feet, hauled over 1/2 mile of woods road, 1-1/2 miles of graded dirt road, and 4 miles of gravel road.

Application of Data to Other Conditions

It is realized that cutting and hauling conditions, timber size, and the type of trucks and equipment vary from one locality to another. The information given for the Crossett area may not be applied to other areas without first checking on local conditions and making corrections where necessary. To adjust felling and bucking cost as given in table 5 to other conditions all that needs to be done is to compute new daily or hourly costs (table 1), add 20 percent for profit and risk, and divide by the production per day or per hour. If the output per day of felling and bucking crews is more or less than shown, divide the total cost per day as computed from table 1 by the new volume and add 20 percent for profit and risk. For changing skidding cost to some other rate or output per day the same adjustments should be made as in the case of felling and bucking.

The time required for "loading, unloading, and delay" was as follows:

Product	Time required per load for loading, unloading, and delay
	Hours
Pulpwood	1.26
Logs	1.07

Should the time required for loading, unloading, and delay be more or less than the above, increase or decrease the cost for this item in table 5 by the appropriate percentage.

The pulpwood-production costs of table 5 are based on loads averaging 1.98 standard cords. Should the loads in another locality average more or less than this, the cost of loading, unloading, and delay will need to be adjusted upward or downward. To do so, divide the total fixed cost per load (fixed cost per hour, table 3, times number of hours required per load) for pulpwood trucks by the number of cords carried, and increase the result by 20 percent. The same adjustments for loading, unloading, and delay would be necessary in the case of log hauling if the loads carried were greater or less than 1,400 feet Doyle-Scribner rule. In this case, however, it would be necessary to make an adjustment for the cost of the team and driver used in loading as well as for the truck used. To make this adjustment, multiply the loading time per load (.688 hour) by the team rate per hour (table 2). Also multiply the total time the truck was idle while loading, unloading, or delayed, by the truck fixed rate per hour (table 4). Add the two products and divide by the volume per load. The result should then be increased by 20 percent for profit and risk before being substituted in table 5.

Few loads of logs or pulpwood will be hauled over the same distance or the same type of roads as was assumed in this study. In nearly all cases it will, therefore, be necessary to revise the hauling costs reported in table 5. Since hauling cost is based partially on a cost rate dependent upon time required per trip and partially on a cost rate that is dependent upon the distance traveled and the type of road over which the hauling is done, the revision necessary to obtain corrected hauling cost in a particular case is as follows:

1. Determine the round-trip hauling time (exclusive of loading, unloading, and delay) required per load for the haul in question.

2. Multiply this time by the total fixed expense per hour shown in table 3 or 4, depending upon whether the product hauled is pulpwood or logs.

3. Determine the number of miles or fractions of a mile of ungraded woods or other low-quality road and of good graded dirt or higher-class road traversed in making a round trip. Multiply the number of miles of each type of road by the appropriate rate from table 3 or 4, or a similar revised table.

4. Add the fixed and the running expenses per load.

5. Divide the total cost per load by the average volume hauled to get the corrected hauling cost for the particular set of conditions under which the hauling is being done.

This completes the major adjustments of the rates given in table 5 to make them apply to other conditions. Other minor corrections sometimes may be necessary to obtain very accurate costs. For practical purposes, however, the major adjustments are all that need be considered to obtain good pulpwood- or log-production costs where equipment and methods are similar to those described.